

CLAIMS

What is claimed is:

1. A laser diode arrangement (10) for generating single-mode tunable laser radiation (15), comprising a laser diode (11) having a rear facet (16) and a front facet (17) and forming a first resonator (R1), an external, second resonator (R2) coupled to said first resonator (R1), at least one optical transmission component (30) and at least one wavelength selective optical reflection element (40, 50) arranged in the laser light path between said first and said second resonators R1, R2) for coupling light back into the first resonator (R1) by way of said rear facet (16), the ratio of the reflectivity of the rear facet (16) to the reflectivity of the optical reflection element (40) being smaller than 1.

2. A laser diode arrangement according to claim 1, wherein the ratio of the reflectivity of the rear facet (16) and the reflectivity of the optical reflection element (40) is smaller than 0.1.

3. A laser diode arrangement according to claim 1, wherein the reflectivity of the rear facet (16) is 0.01 or smaller and the reflectivity of the optical reflection element (40) is at least 0.95.

4. A laser diode arrangement according to claim 1, wherein the laser diode (11) has an axial length (10) which is at least 500  $\mu\text{m}$ .

5. A laser diode arrangement according to claim 1, wherein an optical transmission component (70) is arranged adjacent the rear facet (16).

6. A laser diode arrangement according to claim 1, wherein said arrangement includes a structure (60) for changing the quality of coupling of the first resonator (R1) to the second, external resonator (R2).

7. A laser diode arrangement according to claim 6, wherein the structure (60) for changing the coupling quality is disposed on, or in, the first resonator (R1).

8. A laser diode arrangement according to claim 6, wherein the structure (60) for changing the coupling quality of the first and second resonators is disposed on, or in, the laser diode (11).

9. A laser diode arrangement according to claim 6, wherein the structure (60) for changing the coupling quality of the first and second resonators comprises a connector contact (61) which is divided into first and second independently controllable connector segments (62, 63).

10. A laser diode arrangement according to claim 9, wherein said connector contact is divided along a plan extending normal to the longitudinal axis (A) of the laser diode (11) and the first connector segment (62) which is disposed adjacent the rear facet (16) has a length (L) which is greater than the length ( $\ell$ ) of the second connector segment (63).

11. A laser diode arrangement according to claim 9, wherein said laser diode arrangement includes a control circuit (66) which is connected to each connector segment (62, 63) for supplying control currents thereto.

12. A laser diode arrangement according to claim 1, wherein the control current supplied by said control circuit to said first connector segment (62) is constant.

13. A laser diode arrangement according to claim 12, wherein the control current supplied to said second connector segment 63 is variable depending on the position of the wavelength selective optical reflection elements (40, 50) with respect to the laser diode (11).

14. A laser diode arrangement according to claim 13, wherein the control current supplied to said second connector segment (63) and the position of the wavelength selective optical reflection element or elements (40, 50) are in a relationship which is determinable by said control circuit (68).

15. A laser diode arrangement according to claim 9, wherein the control current supplied to the second connector segment (63) is adjustable depending on the power of the laser radiation coupled out of the laser diode arrangement.

16. A laser diode arrangement according to claim 1, wherein the rear facet of said laser diode is high-reflection coated.

17. A laser diode arrangement according to claim 1, wherein the front facet (17) of the laser diode (11) facing the

external resonator (R2) of the laser diode (11) is provided with an antireflection coating.

18. A laser diode arrangement according to claim 17, wherein the reflectivity of the antireflection-coated front facet (17) of said laser diode (11) is less than 0.001.

19. A laser diode arrangement according to claim 1, wherein said laser diode (11) includes a zone which has an active zone of rectangular or trapezoidal shape.

20. A laser diode arrangement according to claim 1, wherein said optical transmission component includes a collimator (32).

21. A laser diode arrangement according to claim 1, wherein said wavelength selective reflection element (40) is an optical diffraction grating.

22. A laser diode arrangement according to claim 1, wherein said wavelength selecting reflection element (50) is a mirror.

23. A laser diode arrangement according to claim 1, wherein said laser diode (11) and said external second resonator (R2) form one of a Littman and a Littrow arrangement.

24. A laser diode arrangement according to claim 1, wherein the laser diode is a quantum cascade laser.

25. A laser diode arrangement (10) for generating a single mode tunable laser radiation (15) comprising a laser diode (11) having a rear facet (16) and a front facet (17) and forming a

first resonator (R1), an external, second resonator (R2) coupled to said first resonator (R1), at least one optical transmission component (30) and at least one wavelength selective optical reflective element (40, 50) arranged in the laser light path between the first and second resonators (R1, R2) for coupling laser light from the second resonator (R2) back into the first resonator (R1), said optical transmission component (30) including a diffracting cylinder lens (34) having an axis (2), which extends essentially parallel to the laser diode axis.

26. A laser diode arrangement according to claim 25, wherein said cylinder lens (34) is arranged between the laser diode (11) and the collimator (32).

27. A laser diode arrangement according to claim 25, wherein said collimator (32) is arranged between said laser diode (11) and said cylinder lens (34).

28. A laser diode arrangement according to claim 25, wherein said optical reflection element (40) comprises two partial gratings (47, 48) which are arranged at an angle of  $90^\circ$  relative to each other.